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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,922		Benedetto Anthony Iacovelli	AF04001US	1075

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EXAMINER	
KALAFUT, STEPHEN J	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,922	IACOVELLI, BENEDETTO ANTHONY	
	Examiner	Art Unit	
	Stephen J. Kalafut	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-72 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 1-27, 39-43 and 50-57 is/are allowed.

6)☒ Claim(s) 28,29,32,35,44,45,58,59,63,65,66 and 70 is/are rejected.

7)☒ Claim(s) 30,31,33,34,36-38,46-49,60-62,64,67-69,71 and 72 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 October 2005 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 27, 28, 44 and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Shigeta *et al.* (US 4,522,895).

Shigeta *et al.* disclose a contiguous substrate comprising a layer (9) that is relatively dense, and thus having relatively lower pore density, between two layers (8) that are relatively porous, and thus have higher pore density. See figure 3 and column 2, lines 41-45. The substrate includes passages (7) for reactants in each relatively porous region, and would thus constitute a flow-through electrode. Each of the faces of the stack would correspond to one of the four sides recited in claims 44 and 45, with each layer (9), in conjunction with a catalyst layer (2), forming a planar electrode with its edge defining the sides. The passages (7) extend from one side to a second side. Since some of these are perpendicular to others, some would extend between first and second sides, with the others extending from third to fourth sides. Each passage would be a channel defined thereby, able to conduct fluids from one side to the opposite side. Since each side is open to fluid fed from a common source (column 1, lines 6-9), the channels would communicate, in parallel, between more than one anode.

Claim 32 is rejected under 35 U.S.C. 102(e) as being anticipated by Mardilovich *et al.* (US 7,070,879).

Mardilovich *et al.* discloses an electrode for a fuel cell, which comprises two regions (230, 240) having different pore sizes (column 6, lines 21-28). These may also have different porosities (column 6, lines 31-34), thus defining a porosity gradient. Because the pores are mostly interconnected or open (column 6, lines 34-36), the reactant within the electrode may flow with or against the gradient. Some embodiments (figures 15 and 16) also include through passages within the electrode, which would thus be a flow-through electrode.

Claim 35 is rejected under 35 U.S.C. 102(b) as being anticipated by Brokman *et al.* (US 5,185,218).

Brokman *et al.* disclose a fuel cell including an anode (148), a cathode (114), a porous barrier (144) between them, a channel (146) around the anode, and spaces between the barrier and each electrode, the spaces between the barrier and cathode constituting a channel. Recitation of the use of the channel, "for receiving a fuel-depleted fluid", does not distinguish.

Claim 58 is rejected under 35 U.S.C. 102(b) as being anticipated by Margiott (US 6,365,291).

Margiott discloses a fuel cell comprising a fluid inlet and outlet (upper and lower ends of water transport plate 40), and a conduit, formed of sections 44, 84, 86, 42 and 60, which has an inlet adjacent to the fuel cell outlet and an outlet adjacent to the fuel cell inlet, and which also

includes a semi-permeable wall (76), through which water may pass, but not other substances, such as gaseous fuel (column 9, lines 12-23).

Claims 59 and 63 are rejected under 35 U.S.C. 102(b) as being anticipated by Tytgat *et al.* (US 4,783,381).

Tytgat *et al.* disclose a fuel cell including a chamber (3) that contains alkaline electrolyte, which is aqueous NaOH (column 4, lines 15-23). The anode is made of titanium gauze, a porous substrate, coated with the catalyst $2(RuO_2)RhSbO_4$ (column 6, lines 9-11). Operation of this cell would to some extent entail movement of this alkaline electrolyte through the porous electrode.

Claims 65 and 66 are rejected under 35 U.S.C. 102(b) as being anticipated by Roberts *et al.* (US 6,329,089).

Roberts *et al.* disclose a fuel cell in which at least a portion of the electrodes, and thus at least one electrode, is starved of reactant (column 3, lines 41-47). This action purges electrode poison, and thus cleans the electrode(s) (column 3, lines 5-10). A load may also be connected and disconnected from the electrode(s) (column 4, lines 20-25).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shigeta *et al.* in view of Collins *et al.* (US 6,322,915).

The central section of the electrode disclosed by Shigeta *et al.*, which would correspond to the present "third region", is not hollow. Collins *et al.* disclose a fuel cell plate with reactant passages on either side and a central region (80) that includes passages (82A, 82B, etc.) for coolant (column 8, lines 15-24), which region would thus be substantially hollow. Because these passages would enable coolant to remove heat from the fuel cell, it would be obvious to use the coolant region of Collins et al. as the central layer in the electrode structure of Shigeta *et al.*

Claim 70 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts *et al.* in view of Takabayashi (US 5,023,150).

While Roberts *et al.* disclose a load being connected intermittently (column 4, lines 26), they do not disclose the use of an electrical controller to switch one or more electrodes between electron-collecting and refresh cycles, *i.e.*, between normal use and being cleaned. Takabayashi disclose an electrical controller (11) used to control the operation of a switch (22). Because such a controller can be programmed (column 5, lines 43-46) to respond to operating conditions, it would be obvious to use the controller of Takabayashi to control the connection and disconnection of the load to the electrodes of Roberts *et al.*, and thus switch them between electron-collecting and refresh cycles.

Claims 30, 31, 33, 34, 36-38, 46-49, 60-62, 64, 67-69, 71 and 72 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form

including all of the limitations of the base claim and any intervening claims. The prior art cited herein does not disclose a flow-through electrode comprising regions of different porosities that also include porous substrates and thin catalytic films thereon in each region; a fuel cell with a porous barrier between the anode and cathode, with channels between each electrode and the barrier, where the anode comprises a porous substrate and a thin catalytic film thereon, or a separator device communicating with both electrode channels; a fuel cell comprising first and second anodes communicating with a channel, comprising a porous substrate, a plurality of cathodes and cathode channels, and a device communicating with the anode section for removing water from a fuel/electrolyte mixture by a pressure differential; a fuel cell having four sides, with planar anodes parallel to each other and defining channels that communicate between two sides, and cathodes that likewise define channels that communicate between the other two sides, which also includes a device for separating water from a fuel/electrolyte mixture by a pressure differential; a method for operating a fuel cell where a fluid containing alkaline electrolyte flows through an electrode having a porous substrate and a catalyst, which includes an additive for supplying additional hydroxyl ions or for cleaning the electrolyte, or where the fluid flow includes oscillation; or a method of operating a fuel cell in which at least one electrode is switched from electron-collecting to a refreshing cycle in which the electrode is cleaned, where the refreshing includes applying an electric charge, where one electrode is cleaned while another collects electrons, where an electrolyte-containing fluid flows through the electrodes while one is being refreshed, or where such fluid flow includes oscillation.

Claims 1-27, 39-43 and 50-57 are allowed. The prior art does not disclose an electrode that includes a porous substrate having a plurality of walls between first and second sides, the walls oriented in different directions, and including micro-scale pores therein and a thin catalytic film thereon, where fluids may flow from one side to the other; a fuel cell comprising three anode sections, each with a porous substrate, where the third is between the first two, a cathode comprising two sections, a channel between the first anode and cathode sections, and a channel between the second anode and cathode sections; a fuel cell comprising a plurality of anodes, an anode channel communicating with each anode, and a plurality of cathode and cathode channels, where each cathode channel communicates with both a cathode and an anode channel; or a fuel cell comprising first and second anodes communicating with an anode channel, and a plurality of cathode and cathode channels, where each cathode channel communicates with both a cathode and an anode channel.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The drawings are objected to because of the poor quality of the lines and lettering. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be

labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen J. Kalafut whose telephone number is 571-272-1286. The examiner can normally be reached on Mon-Fri 8:00 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

sjk

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